What is claimed is:

1. A free-cutting copper alloy, consisting essentially of 69 to 79 percent, by weight, of copper; 2.0 to 4.0 percent, by weight, of silicon; 0.02 to 0.4 percent, by weight, of lead; and a remaining percentage, by weight, of zinc, wherein the percent by weight of copper and silicon in the copper alloy satisfy the relationship

$60 \leq X - 3Y \leq 70$,

wherein

X is the percent, by weight, of copper, and

Y is the percent, by weight, of silicon; and

the copper alloy has a metal construction comprising multiple phases integrated to form a composite phase, wherein the composite phase is an α phase matrix having a total phase area comprising not more than 5% of a β phase, and 5-70% of the total phase area is provided by at least one phase selected from the group consisting of a γ phase, a κ phase, and a μ phase.

2. A free-cutting copper alloy, consisting essentially of 69 to 79 percent, by weight, of copper; 2.0 to 4.0 percent, by weight, of silicon; 0.02 to 0.4 percent, by weight, of lead; one element selected from among 0.02 to 0.4 percent, by weight, of bismuth, 0.02 to 0.4 percent, by weight, of tellurium, and 0.02 to 0.4 percent, by weight, of selenium; and a remaining percentage, by weight, of zinc, wherein the percent by weight of copper and silicon in the copper alloy satisfy the relationship

$60 \leq X - 3Y \leq 70$,

wherein

X is the percent, by weight, of copper, and

Y is the percent, by weight, of silicon; and

the copper alloy has a metal construction comprising multiple phases integrated to form a composite phase, wherein the composite phase is an

α phase matrix having a total phase area comprising not more than 5% of a β phase, and 5-70% of the total phase area is provided by at least one phase selected from the group consisting of a γ phase, a κ phase, and a μ phase.

3. A free-cutting copper alloy, consisting essentially of 70 to 80 percent, by weight, of copper; 1.8 to 3.5 percent, by weight, of silicon; 0.02 to 0.4 percent, by weight, of lead; at least one element selected from among 1.0 to 3.5 percent, by weight, of aluminum, and 0.02 to 0.25 percent, by weight, of phosphorus; and a remaining percentage, by weight, of zinc, wherein the percent by weight of copper, silicon, aluminum and phosphorus in the copper alloy satisfy the relationship

$$60 \leq X - 3Y + aZ + bW \leq 70,$$

wherein

X is the percent, by weight, of copper,

Y is the percent, by weight, of silicon,

Z is the percent, by weight, of aluminum,

W is the percent, by weight, of phosphorus,

a is –2, and

b is -3; and

the copper alloy has a metal construction comprising multiple phases integrated to form a composite phase, wherein the composite phase is an α phase matrix having a total phase area comprising not more than 5% of a β phase, and 5-70% of the total phase area is provided by at least one phase selected from the group consisting of a γ phase, a κ phase, and a μ phase.

4. A free-cutting copper alloy, consisting essentially of 70 to 80 percent, by weight, of copper; 1.8 to 3.5 percent, by weight, of silicon; 0.02 to 0.4 percent, by weight, of lead; at least one element selected from among 1.0 to 3.5 percent, by weight, of aluminum, and 0.02 to 0.25

percent, by weight, of phosphorus; one element selected from among 0.02 to 0.4 percent, by weight, of bismuth, 0.02 to 0.4 percent, by weight, of tellurium, and 0.02 to 0.4 percent, by weight, of selenium; and a remaining percentage, by weight, of zinc, wherein the percent by weight of copper, silicon, aluminum and phosphorus in the copper alloy satisfy the relationship

$$60 \leq X - 3Y + aZ + bW \leq 70,$$

wherein

X is the percent, by weight, of copper,

Y is the percent, by weight, of silicon,

Z is the percent, by weight, of aluminum,

W is the percent, by weight, of phosphorus,

a is –2, and

b is –3; and

the copper alloy has a metal construction comprising multiple phases integrated to form a composite phase, wherein the composite phase is an α phase matrix having a total phase area comprising not more than 5% of a β phase, and 5-70% of the total phase area is provided by at least one phase selected from the group consisting of a γ phase, a κ phase, and a μ phase.

5. A free-cutting copper alloy, consisting essentially of 69 to 79 percent, by weight, of copper; 2.0 to 4.0 percent, by weight, of silicon; 0.02 to 0.4 percent, by weight, of lead; at least one element selected from among 0.02 to 0.25 percent, by weight, of phosphorus, 0.02 to 0.15 percent, by weight, of antimony, and 0.02 to 0.15 percent, by weight, of arsenic; and a remaining percentage, by weight, of zinc, wherein the percent by weight of copper, silicon and phosphorous in the copper alloy satisfy the relationship

$$60 \leq X - 3Y + aZ \leq 70,$$

wherein

X is the percent, by weight, of copper,

Y is the percent, by weight, of silicon,

Z is the percent, by weight, of phosphorous, and

a is -3; and

the copper alloy has a metal construction comprising multiple phases integrated to form a composite phase, wherein the composite phase is an α phase matrix having a total phase area comprising not more than 5% of a β phase, and 5-70% of the total phase area is provided by at least one phase selected from the group consisting of a γ phase, a κ phase, and a μ phase.

6. A free-cutting copper alloy, consisting essentially of 69 to 79 percent, by weight, of copper; 2.0 to 4.0 percent, by weight, of silicon; 0.02 to 0.4 percent, by weight, of lead; at least one element selected from among 0.02 to 0.25 percent, by weight, of phosphorus, 0.02 to 0.15 percent, by weight, of antimony, and 0.02 to 0.15 percent, by weight, of arsenic; one element selected from among 0.02 to 0.4 percent, by weight, of bismuth, 0.02 to 0.4 percent, by weight, of tellurium, and 0.02 to 0.4 percent, by weight, of selenium; and the remaining percent, by weight, of zinc, wherein the percent by weight of copper, silicon and phosphorous in the copper alloy satisfy the relationship

$60 \leq X - 3Y + aZ \leq 70$,

wherein

X is the percent, by weight, of copper,

Y is the percent, by weight, of silicon,

Z is the percent, by weight, of phosphorous, and

a is -3; and

the copper alloy has a metal construction comprising multiple phases integrated to form a composite phase, wherein the composite phase is an α phase matrix having a total phase area comprising not more than 5% of a β phase, and 5-70% of the total phase area is provided by at least one

phase selected from the group consisting of a γ phase, a κ phase, and a μ phase.

7. A free-cutting copper alloy, consisting essentially of 62 to 78 percent, by weight, of copper; 2.5 to 4.5 percent, by weight, of silicon; 0.02 to 0.4 percent, by weight, of lead; at least one element selected from among 0.2 to 2.5 percent, by weight, of aluminum, and 0.02 to 0.25 percent, by weight, of phosphorus; and at least one element selected from among 0.7 to 3.5 percent, by weight, of manganese and 0.7 to 3.5 percent, by weight, of nickel; and a remaining percentage, by weight, of zinc, wherein the percent by weight of copper, silicon, aluminum, phosphorous, manganese, and nickel in the copper alloy satisfy the relationship

$$60 \leq X - 3Y + aZ + bW + cV + dU \leq 70,$$

wherein

X is the percent, by weight, of copper,

Y is the percent, by weight, of silicon,

Z is the percent, by weight, of aluminum,

W is the percent, by weight, of phosphorous,

V is the percent, by weight, of manganese,

U is the percent, by weight, of nickel,

a is –2,

b is –3,

c is 2.5, and

d is 2.5, and the percent by weight of silicon, manganese and nickel satisfy the relationship

$0.7 \leq Y/(V + U) \leq 6$; and

the copper alloy has a metal construction comprising multiple phases integrated to form a composite phase, wherein the composite phase is an α phase matrix having a total phase area comprising not more than 5% of a β phase, and 5-70% of the total phase area is provided by at least one

phase selected from the group consisting of a γ phase, a κ phase, and a μ phase.

8. A free-cutting copper alloy, consisting essentially of 69 to 79 percent, by weight, of copper; 2.0 to 4.0 percent, by weight, of silicon; 0.02 to 0.4 percent, by weight, of lead; 0.1 to 1.5 percent, by weight, of aluminum; and 0.02 to 0.25 percent, by weight, of phosphorus; and a remaining percentage, by weight, of zinc, wherein the percent by weight of copper, silicon, aluminum, and phosphorous in the copper alloy satisfy the relationship

$$60 \leq X - 3Y + aZ + bW \leq 70,$$

wherein

X is the percent, by weight, of copper,

Y is the percent, by weight, of silicon,

Z is the percent, by weight, of aluminum,

W is the percent, by weight, of phosphorous,

a is –2, and

b is –3; and

the copper alloy has a metal construction comprising multiple phases integrated to form a composite phase, wherein the composite phase is an α phase matrix having a total phase area comprising not more than 5% of a β phase, and 5-70% of the total phase area is provided by at least one phase selected from the group consisting of a γ phase, a κ phase, and a μ phase.

9. A free-cutting copper alloy, consisting essentially of 69 to 79 percent, by weight, of copper; 2.0 to 4.0 percent, by weight, of silicon; 0.02 to 0.4 percent, by weight, of lead; 0.1 to 1.5 percent, by weight, of aluminum; 0.02 to 0.25 percent by weight, of phosphorus; one element selected from among 0.02 to 0.4 percent, by weight, of bismuth, 0.02 to 0.4 percent, by weight, of tellurium, and 0.02 to 0.4 percent, by weight, of

selenium; and a remaining percentage, by weight, of zinc, wherein the percent by weight of copper, silicon, aluminum, and phosphorous in the copper alloy satisfy the relationship

$$60 \leq X - 3Y + aZ + bW \leq 70,$$

wherein

X is the percent, by weight, of copper,

Y is the percent, by weight, of silicon,

Z is the percent, by weight, of aluminum,

W is the percent, by weight, of phosphorous,

a is –2, and

b is –3; and

the copper alloy has a metal construction comprising multiple phases integrated to form a composite phase, wherein the composite phase is an α phase matrix having a total phase area comprising not more than 5% of a β phase, and 5-70% of the total phase area is provided by at least one phase selected from the group consisting of a γ phase, a κ phase, and a μ phase.

10. A free-cutting copper alloy, consisting essentially of 69 to 79 percent, by weight, of copper; 2.0 to 4.0 percent, by weight, of silicon; 0.02 to 0.4 percent, by weight, of lead; 0.1 to 1.5 percent, by weight, of aluminum; 0.02 to 0.25 percent, by weight, of phosphorus; at least one element selected from among 0.02 to 0.4 percent, by weight, of chromium and 0.02 to 0.4 percent, by weight, of titanium; and a remaining percentage, by weight, of zinc, wherein the percent by weight of copper, silicon, aluminum, phosphorous and chromium in the copper alloy satisfy the relationship

$$60 \leq X - 3Y + aZ + bW + cV \leq 70,$$

wherein

X is the percent, by weight, of copper,

Y is the percent, by weight, of silicon,

Z is the percent, by weight, of aluminum,

W is the percent, by weight, of phosphorous,

V is the percent, by weight, of chromium,

a is –2,

b is –3, and

c is 2; and

the copper alloy has a metal construction comprising multiple phases integrated to form a composite phase, wherein the composite phase is an α phase matrix having a total phase area comprising not more than 5% of a β phase, and 5-70% of the total phase area is provided by at least one phase selected from the group consisting of a γ phase, a κ phase, and a μ phase.

11. A free-cutting copper alloy, consisting essentially of 69 to 79 percent, by weight, of copper; 2.0 to 4.0 percent, by weight, of silicon; 0.02 to 0.4 percent, by weight, of lead; 0.1 to 1.5 percent, by weight, of aluminum; 0.02 to 0.25 percent, by weight, of phosphorus; at least one element selected from among 0.02 to 0.4 percent, by weight, of chromium and 0.02 to 0.4 percent by weight of titanium; one element selected from among 0.02 to 0.4 percent, by weight, of bismuth, 0.02 to 0.4 percent, by weight, of tellurium and 0.02 to 0.4 percent, by weight, of selenium; and a remaining percentage, by weight, of zinc, wherein the percent by weight of copper, silicon, aluminum, phosphorous and chromium in the copper alloy satisfy the relationship

$$60 \leq X - 3Y + aZ + bW + cV \leq 70,$$

wherein

X is the percent, by weight, of copper,

Y is the percent, by weight, of silicon,

Z is the percent, by weight, of aluminum,

W is the percent, by weight, of phosphorous,

V is the percent, by weight, of chromium,

a is –2,

b is –3, and

c is 2; and

the copper alloy has a metal construction comprising multiple phases integrated to form a composite phase, wherein the composite phase is an α phase matrix having a total phase area comprising not more than 5% of a β phase, and 5-70% of the total phase area is provided by at least one phase selected from the group consisting of a γ phase, a κ phase, and a μ phase.

12. A free-cutting copper alloy which comprises 69 to 79 percent, by weight, of copper; 2.0 to 4.0 percent, by weight, of silicon; 0.02 to 0.4 percent, by weight, of lead; optionally, at least one element selected from among 0.02 to 0.25 percent, by weight, of phosphorus, 0.02 to 0.15 percent, by weight, of antimony, and 0.02 to 0.15 percent, by weight, of arsenic; optionally, one element selected from among 0.02 to 0.4 percent, by weight, of bismuth, 0.02 to 0.4 percent, by weight, of tellurium, and 0.02 to 0.4 percent, by weight, of selenium; and the remaining percent, by weight, of zinc, wherein the percent by weight of copper, silicon and phosphorous in the copper alloy satisfy the relationship

$60 \leq X - 3Y + aZ \leq 70$,

wherein

X is the percent, by weight, of copper,

Y is the percent, by weight, of silicon,

Z is the percent, by weight, of phosphorous, and

a is -3; and

the copper alloy has a metal construction comprising multiple phases integrated to form a composite phase, wherein the composite phase is an α phase matrix having a total phase area comprising not more than 5% of a β phase, and 5-70% of the total phase area is provided by at least one

phase selected from the group consisting of a γ phase, a κ phase, and a μ phase.

13. A free-cutting copper alloy which comprises 70 to 80 percent, by weight, of copper; 1.8 to 3.5 percent, by weight, of silicon; 0.02 to 0.4 percent, by weight, of lead; optionally, at least one element selected from among 1.0 to 3.5 percent, by weight, of aluminum, and 0.02 to 0.25 percent, by weight, of phosphorus; optionally, one element selected from among 0.02 to 0.4 percent, by weight, of bismuth, 0.02 to 0.4 percent, by weight, of tellurium, and 0.02 to 0.4 percent, by weight, of selenium; and the remaining percent, by weight, of zinc, wherein the percent by weight of copper, silicon, aluminum and phosphorus in the copper alloy satisfy the relationship

$$60 \leq X - 3Y + aZ + bW \leq 70,$$

wherein

X is the percent, by weight, of copper,
Y is the percent, by weight, of silicon,
Z is the percent, by weight, of aluminum,
W is the percent, by weight, of phosphorus,
a is –2, and
b is -3; and

the copper alloy has a metal construction comprising multiple phases integrated to form a composite phase, wherein the composite phase is an α phase matrix having a total phase area comprising not more than 5% of a β phase, and 5-70% of the total phase area is provided by at least one phase selected from the group consisting of a γ phase, a κ phase, and a μ phase.

14. A free-cutting copper alloy which comprises 69 to 79 percent, by weight, of copper; 2.0 to 4.0 percent, by weight, of silicon; 0.02 to 0.4 percent, by weight, of lead; 0.1 to 1.5 percent, by weight, of aluminum;

0.02 to 0.25 percent, by weight, of phosphorus; optionally, at least one element selected from among 0.02 to 0.4 percent, by weight, of chromium and 0.02 to 0.4 percent by weight of titanium; optionally, one element selected from among 0.02 to 0.4 percent, by weight, of bismuth, 0.02 to 0.4 percent, by weight, of tellurium and 0.02 to 0.4 percent, by weight, of selenium; and the remaining percent, by weight, of zinc, wherein the percent by weight of copper, silicon, aluminum, phosphorous and chromium in the copper alloy satisfy the relationship

$$60 \leq X - 3Y + aZ + bW + cV \leq 70,$$

wherein

X is the percent, by weight, of copper,

Y is the percent, by weight, of silicon,

Z is the percent, by weight, of aluminum,

W is the percent, by weight, of phosphorous,

V is the percent, by weight, of chromium,

a is –2,

b is –3, and

c is 2; and

the copper alloy has a metal construction comprising multiple phases integrated to form a composite phase, wherein the composite phase is an α phase matrix having a total phase area comprising not more than 5% of a β phase, and 5-70% of the total phase area is provided by at least one phase selected from the group consisting of a γ phase, a κ phase, and a μ phase.